



Installation and Operating Instructions

PowerSafe PS3

Digital energy meter for single and three-phase electrical systems

Introduction

The Integra Ci3 digital meter is designed for accurate measurement and display of all major electrical and power quality parameters, in single-phase two wire, and three-phase three and four-wire system configurations.

Measurement

In measurement mode, the buttons control the displayed measurement as follows:

	is used to select the Voltage and Frequency display screens. In set-up mode this is the “Back” button.
	is used to select the Current display screens. In set-up mode this is the “Up” button.
	is used to select the Power and Power Factor display screens. In set-up mode this is the “Down” button.
	is used to select the Energy display screens. In set-up mode this is the “Enter” button.

Setting up



- Press and hold the two outermost buttons and simultaneously for five seconds until the password screen is displayed.
- Press four times to enter the default password of “0000”.



- The system setup screen will be displayed on the screen. Press the button to scroll down the menu until you see the CT primary setting screen.



- Press the button to enter the CT primary setting screen. The first digit should start flashing.

- Use the and buttons to set the digit to the required level then press to confirm. Repeat this process until all four digits have been set to the desired CT primary value (e.g. 100A = 0100A, 1000A = 1000A).
- The word “SET” should be displayed after the fourth digit has been entered to confirm that the primary CT value has been set.
- Press to return to the first level menu structure, to scroll up and down the structure to adjust another parameter. If no other settings are required, press to exit set-up mode and return to measurement mode.

Setup Menu Structure

Change password

nnnn - 4-digit number – default ‘0000’

Supply systems

3-phase 3- or 4-wire, or Single phase

VT (Ci4 only – see Specification section)

CT Set maximum current that can be monitored according to CT in use, *nnnn* – 4-digit number 0001 to 9999

Demand Interval Time

Selects demand time in minutes – 60/30/20/15/10/8/5/OFF

Reset Resets cumulative energy and Demand measurements to zero

Communication parameters for RS485 interface (optional)

Modbus™ protocol

Baud rate 2400/4800/9600/19200/38400

Parity none/odd/even

Stop bits 1 (1 or 2 if parity is none)

RS485 network address *nnn* – 3-digit number 1 to 247

Order – Norm/Rev indicates if the Modbus™ word order is normal or reversed.

Johnson Controls (JC) N2 protocol

RS485 network address *nnn* – 3-digit number 1 to 255

Relay pulse outputs (optional)

OP1 kWh/kVArh (Active/reactive – Import only)

Output module 1

OP2 kWh/kVArh (Active/reactive – Import only)

Output module 2

Rate 0.1/1/10/100/1000/10,000 kWh or kVArh per pulse

Pulse width 200/100/60 ms

Energy kilo / Mega

Test Phase sequence

Display on – all elements on to check display

Display toggle - Each element is turned on and off

SOFT Displays software version number

Menu Option Selection

- After entering the correct password, use the and buttons to navigate up and down the first level until the desired parameter is reached. Selection does not roll over from bottom to top of list or vice versa.
- Press the button to select the desired parameter and enter the second level menu structure.
- If an item flashes, then it can be adjusted by the and keys. If not, there may be a further layer, e.g. Comms - Baud rate, before adjustment is possible. Press to select the lower layer.
- Having selected an option from the current menu layer, press to confirm your selection. The word SET will come on.

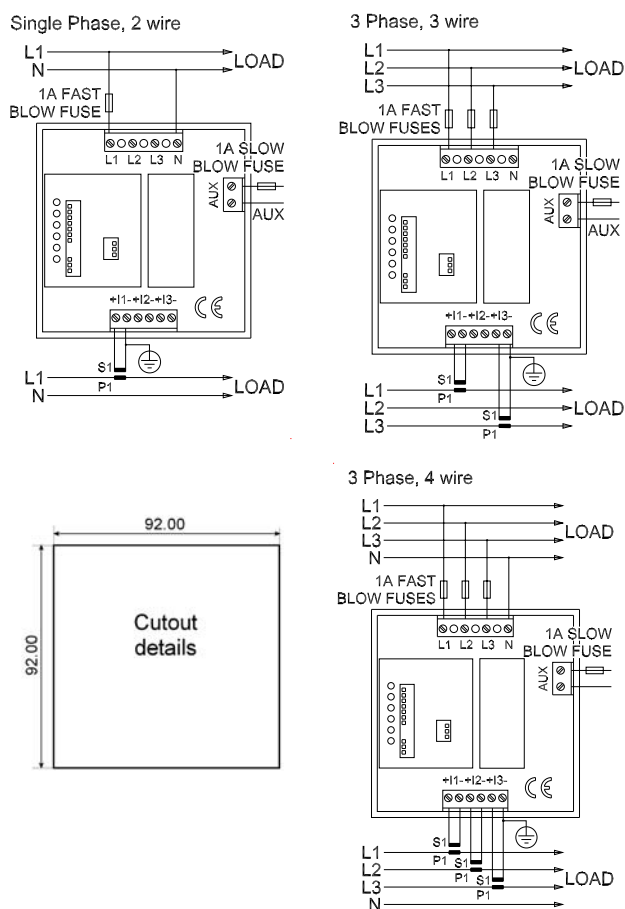
- Having selected an option from the current menu layer, press **E** to confirm your selection. The word SET will come on.
- Once all the necessary selections have been made and the required settings entered, press the **V/Hz** to return to the first level menu structure. The word SET will go off and one can then use the **A** and **P/PF** keys for further menu selection.
- On completion of all setting-up, press **V/Hz** repeatedly until the measurement screen is restored. If no other setting are required then press **V/Hz** to exit set-up mode and return to measurement mode.

Number Entry Procedure

When setting up the unit, some screens require the setting up of a number. In particular, on entry to the setting up section, a password must be entered. Digits are set individually, from left to right. The procedure is as follows:

- The current digit to be set flashes and is set using the **A** and **P/PF** keys.
- Press **E** to confirm each digit setting. The word SET will be displayed once the last digit has been set.
- After setting the last digit, press **V/Hz** to exit the number setting routine.

Installation



The unit may be mounted in a panel of any thickness up to a maximum of 6mm (0.25in). Leave enough space behind the instrument to allow for bends in the connection cables. As the front of panel enclosure conforms to IP52, it is protected from dripping water. The unit is intended for use in a reasonably stable ambient temperature within the range -10 to +55°C. Do not mount the unit where there is excessive vibration or in excessive direct sunlight.

Warnings Caution: Risk of Electric Shock

- During normal operation, voltages hazardous to life may be present at some of the terminals of this unit. Installation and servicing should be performed only by qualified, properly trained personnel abiding by local regulations. Ensure all supplies are de-energised before attempting connection or other procedures.
- Terminals should not be user accessible after installation and external installation provisions must be sufficient to prevent hazards under fault conditions.
- This unit is not intended to function as part of a system providing the sole means of fault protection - good engineering practice dictates that any critical function be protected by at least two independent and diverse means.
- The unit does not have internal fuses therefore external fuses must be used for protection and safety under fault conditions.
- Never open-circuit the secondary winding of an energized current transformer.
- This product should only be operated with CT secondary connections Earthed.
- If this equipment is used in a manner not specified by the manufacturer, protection provided by the equipment may be impaired.
- Auxiliary circuits (communication & relay outputs) are separated from metering inputs and 110-400V auxiliary circuits by at least basic insulation. Such auxiliary circuit terminals are only suitable for connection to equipment which has no user accessible live parts. The insulation for such auxiliary circuits must be rated for the highest voltage connected to the instrument and suitable for single fault condition. The connection at the remote end of such auxiliary circuits should not be accessible in normal use. Depending on application, equipment connected to auxiliary circuits may vary widely. The choice of connected equipment or combination of equipment should not diminish the level of user protection specified.

Safety

The unit is designed in accordance with BS EN 61010-1:2001 (IEC 61010-1:2001) – Permanently connected use, Normal condition. Installation category III, pollution degree 2, basic insulation for rated voltage. Measurement Category III.

EMC Installation Requirements

Whilst this unit complies with all relevant EU EMC (electromagnetic compatibility) regulations, any additional precautions necessary to provide proper operation of this and adjacent equipment will be installation dependent and so the following can only be general guidance:

- Avoid routing wiring to this unit alongside cables and products that are, or could be, a source of interference.
- The auxiliary supply to the unit should not be subject to excessive interference. In some cases, a supply line filter may be required.
- To protect the product against incorrect operation or permanent damage, surge transients must be controlled. It is good EMC practice to suppress transients and surges at the source. The unit has been designed to automatically recover from typical transients; however in extreme circumstances it may be necessary to temporarily disconnect

the auxiliary supply for a period of greater than 10 seconds to restore correct operation.

- Screened communication leads are recommended and may be required. These and other connecting leads may require the fitting of RF suppression components, such as ferrite absorbers, line filters etc., if RF fields cause problems.
- It is good practice to install sensitive electronic instruments that are performing critical functions in EMC enclosures that protect against electrical interference causing a disturbance in function.

Wiring

Input connections are made to screw clamp terminals. Choice of cable should meet local regulations for the operating voltage and current. **The current inputs of this product are designed for connection into systems via current transformers only.** Instrument transformers used for connection to the meter must be of approved type and compliant with ANSI/IEEE C57.13 or IEC 60044-1, selected and sized appropriate to the supply network being monitored. All negative current inputs are commoned inside the unit and grounding should be at one point only. To minimise measurement errors, the CTs should be grounded as shown in the wiring diagram. CT secondaries must be grounded in accordance with local regulations. It is desirable to make provision for shorting links to be made across CTs to permit easy replacement of a unit should this ever be necessary.

All connections are made to screw clamp terminals. Terminals are suitable for copper wires only and will accept one stranded 0.05 - 2.5mm² (30 - 12AWG) stranded or solid core cables. Instruments are intended for panel mounting. Terminals must be enclosed within the panel. Use wire rated at 600V for main terminals, 60°C minimum temperature. Terminal screws are fully tightened for shipment and must be undone before wire insertion. Terminal screws should be tightened to 0.5 Nm (4.4 lbf in) only.

Additional considerations for three wire systems

The neutral terminal (terminal N) is indirectly connected to the voltage input terminals (terminals L1, L2, L3). When connected to a three wire system the neutral terminal will adopt a potential somewhere between the remaining lines. If external wiring is connected to the neutral terminal it must be connected to either the neutral line or earth (ground) to avoid the possibility of electric shock from the neutral terminal.

Fusing

This unit must be fitted with external fuses in voltage and auxiliary supply lines. Voltage input lines must be fused with a fast blow fuse 1A maximum. Auxiliary supply lines must be fused with a slow blow fuse rated 1A maximum (if product is powered line-to-line, ensure both lines are fused). Choose fuses of a type and with a breaking capacity appropriate to the supply and in accordance with local regulations.

A suitable switch or circuit breaker conforming to the relevant parts of IEC 60947-1 and IEC 60947-3 should be included in the installation. It should be positioned so as to be easy to operate, in close proximity to the equipment, and clearly identified as the disconnecting device.

Earth/Ground Connections

For safety reasons, current transformer secondary connections should be grounded in accordance with local regulations. Under no circumstances should the product be operated without this Earth connection.

Maintenance

In normal use, little maintenance is needed. As appropriate for service conditions, isolate from electrical power, inspect the unit, and remove any dust or other foreign material present. Periodically check all connections for freedom from corrosion and screw tightness, particularly if vibration is present.

The front of the case should be wiped with a dry cloth only. Use minimal pressure, especially over the viewing window area. If necessary wipe the rear case with a dry cloth. If a cleaning agent is necessary, isopropyl alcohol is the only recommended agent

and should be used sparingly. Water should not be used. If the rear case exterior or terminals should be contaminated accidentally with water, the unit must be thoroughly dried before further service. Should it be suspected that water might have entered the unit, factory inspection and refurbishment is recommended.

Specification

Measurement Inputs

Imported energies are recorded.

Three current inputs (six physical terminals) with 2.5mm² stranded wire capacity for connection of external CTs.

Voltage inputs through 4-way fixed connector with 2.5mm² stranded wire capacity. 3-Phase 3- and 4-wire and Single-phase 2-wire unbalanced. Line frequency measured from L1 voltage or L3 voltage.

Direct measurement of 173 to 500Vac L-L (100 to 289Vac L-N).
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Range of Use

Values of measured quantities, components of measured quantities, and quantities which affect measurement errors to some degree, for which the product gives meaningful readings:

Voltage	5 ... 120% of Range Maximum (below 5% of Range Maximum voltage, current indication may only be approximate)
Current	1 ... 120% of nominal
Active power	1 ... 144% of nominal, 360MW maximum
Apparent power	1 ... 144% of nominal, 360MVA maximum

Power is only registered when voltage and current are within their respective range of use.

Accuracy

Voltage (V)	0.5% of range maximum
Current (A)	0.5% of range maximum (4% for I2 in three-wire mode)
Neutral current calculated (A)	4% of range maximum
Frequency (Hz)	0.11 Hz
Power factor (PF)	1% of unity
Active power (W)	± 1% of range maximum
Reactive power (VAr)	± 1% of range maximum
Apparent power (VA)	± 1% of range maximum
Active energy (kWh)	Class 1 (IEC 62053-21) section 4.6
Reactive energy (kVArh)	± 1% of range maximum
THD	1% up to 31 st harmonic
Response time to step input	1s typical to >99% of final value

Auxiliary Supply

Operating range	110 to 400V AC nominal ±10% (99-440V AC absolute limits) 120 to 350V DC nominal ±20% (96-420V DC absolute limits)
Frequency Range	45 to 66 Hz
Burden	5VA nominal

Option Modules

Pulsed output relays	1 per module* (maximum 2 modules fitted per meter)
Contact rating	50mA max at 250V AC for general switching applications
Type	Solid state relay
RS485 output module	1 channel per module, (maximum 1 module fitted per meter)
Type	2-wire half duplex
Baud rate	2400, 4800, 9600, 19200, 38400

*Ensure any external circuits connected to either relay or RS-485 output modules are provided with double/reinforced insulation.

Reference Conditions of Influence Quantities

Influence Quantities are variables that affect measurement errors to a minor degree. Accuracy is verified under nominal value (within the specified tolerance) of these conditions.

Ambient temperature	23°C ±1°C
Input waveform	50 or 60Hz ±2%
Input waveform	Sinusoidal (distortion factor <0.005)
Auxiliary supply voltage	Nominal ±1%
Auxiliary supply frequency	Nominal ±1%
Auxiliary supply waveform (if AC)	Sinusoidal (distortion factor <0.05)
Magnetic field of external origin	Terrestrial flux

Environment

Operating temperature	-10°C to +55°C*
Storage temperature	-20°C to +70°C*
*Maximum operating and storage temperatures are in the context of typical daily and seasonal variation.	
Relative humidity	0 to 90%, non-condensing
Altitude	Up to 2000m
Warm up time	1 minute
Vibration	10Hz to 50Hz, IEC 60068-2-6, 2g
Shock	30g in 3 planes
Dielectric voltage withstand test	2.2kV rms 50Hz for 1 minute between Measuring Voltage Inputs to RS485 and Relay, and between Auxiliary to RS485 and Relay.



Front Face Only

Mechanics

Dimensions	96 × 96 mm (L×W)
Depth (behind panel)	53 mm, 77.5 mm with option module(s)
Case protrusion (front of panel)	20 mm maximum
Sealing	IP52 (front panel), IP30 (case) (minimum)
Mounting	DIN 96 panel mounting

Approval, Certification, and Standards Compliance

EMC, Emissions	BS EN 61326, Class A (Industrial)
EMC, Immunity	BS EN 61326, Class A (Industrial)
Safety	BS EN 61010-1:2001

Specification Input

Nominal input voltage	
CI3-01	100 to 289V AC L-N (173 to 500V AC L-L)
CI4	60 to 120V AC L-N (104 to 208V AC L-L)
Max. continuous input overload voltage	120% of nominal (Maximum 600V AC L-L)
Max. short duration input voltage	2 x range maximum (1 second application repeated 5 times at 5 minute intervals)
Nominal input voltage burden	< 0.2VA per phase
Nominal input current	5A AC rms
Max. continuous input overload current	120% of nominal
Max. short duration input current	10 x nominal (1 second application repeated 5 times at 5 minute intervals)
Frequency	45 to 66Hz

